

REMARKS

Claims 20-38 are present in the application.

Claims 28-30 have been allowed.

In the Amendment filed on January 6, 2003, applicant submitted a proposed substitute specification. It is requested that the Examiner confirm that the new specification has been entered.

In the "Office Action Summary" of the Examiner's action, it is checked that "This action is FINAL." Applicant respectfully submits that this holding is premature. As is clear from paragraph 9 of the Office action, applicant is pleased to note that the original rejections based upon the patent to Onoguchi *et al.* were withdrawn in view of applicant's explanations. As a result, the Examiner now is relying upon the newly cited patent to Vogeley *et al.* and new interpretations of Grodzins *et al.* in combination with Yan *et al.* These rejections were not necessitated upon amendments to the claims but rather upon withdrawal of the original rejections.

In paragraph 10 of the Office action, the Examiner indicated that applicant's previous Amendment failed to comply with Rule 111(b). This appears to be an error in that it appears that the Examiner overlooked the arguments present at page 14, line 19 through page 15, line 27 which were directed to the shortcomings of the Grodzins *et al.* patent with respect to particular recitations in the claims. Those arguments are respectfully

repeated, as follows:

"The patent of *Grodzins* describes the method and device, which coincide with their intended use with the claimed and which also use secondary radiation excited in the object's substance to determine density of the elements of the object's internal structure. But, the claimed method and device differ from those known from the *Grodzins* patent by the totality of the performed operations and design.

In particular, in the claimed method, concentration of the primary radiation from the X-ray source (sources) (1) is performed in a small zone (16), surrounding an inner point of the object, while in the claimed device there are means for such concentration. It is the point, in which it is required to determine density of the substance (it was explained above that it is referred to as "the current point, to which the measurement results are attributed"). If there is only one source of primary X-rays, then this means for X-rays concentration is the focusing X-ray lens (2). If there are several sources of primary X-rays, then the X-rays concentration means may be either several focusing X-ray lenses (2), which outlet focuses coincide, or several X-ray half-lenses (21), forming crossing beams, or several collimators (13, 18), forming similar beams. Respectively, the concentration zone (16) is either the focal zone of the X-ray lens (lenses), or the zone where the said beams are crossing. The mutual peculiarity of the performed concentration in all options of embodiment of the method and device is that is a small in size internal zone (16) of the object, X-rays intensity is ensured that is considerably increased compared to other exposed elements of the internal structure. The object (or the target part of the object) is

scanned by way of moving the said X-rays concentration zone. In the method and device according to the Grodzins patent, action on the object is done by a narrow "pencil" beam of radiation penetrating through the object, while scanning is performed by way of parallel movement of this beam. In this instance, in contrast to the claimed method and device, all elements of the object's internal structure that are on the path of the said beam are in the same conditions (if one disregards considerable attenuation for elements that are more distant from the source), including the elements that are not to be investigated. Those of them that are closer to the source of radiation are exposed to even more extensive irradiation than the internal elements under study. In other words, in the method and device according to the Grodzins patent, there is no radiation concentration similar to the one that takes place in the claimed method and device.

Object scanning means, image processing means are also different."

All of the Examiner's present rejections are based upon the patent to Grodzins *et al.*, either standing alone (claims 20 and 21) or in combination with Yan *et al.* (claims 22-26), or in combination with Vogeley *et al.* (claim 27), or in combination with Vogeley *et al.* in further view of Yan *et al.* (claims 31-38.)

The applicant's response of January 6, 2003 contained specific arguments in respect of the **Grodzins** patent. It was particularly noted, that in the claimed method, in contrast to the **Grodzins** patent, concentration of the primary radiation from the X-ray source (sources) (1) is performed in a small

zone (16), surrounding an inner point (4) of the object, while in the claimed device there are means for such concentration. Point (voxel) (4) is the point, in which it is required to determine density of the substance (its was explained above that it is referred to as the current voxel, to which the measurement results are attributed. If there is only one source of primary X-rays, then this means for X-rays concentration is the focusing X-ray lens (2). If there are several sources of primary X-rays, then the X-rays concentration means may be either several focusing X-ray lenses (2), which outlet focuses coincide, or several X-ray half-lenses (21), forming crossing beams, or several collimators (13, 18), forming similar beams. Respectively, the concentration zone (16) is either the focal zone of the X-ray lens (lenses), or the zone where the said beams are crossing. The mutual peculiarity of the performed concentration in all options of embodiment of the method and device is that there is a small in size internal zone (16) of the object, so X-rays intensity is ensured that is considerably increased compared to other exposed elements of the internal structure. The object (or the target part of the object) is scanned by way of moving the said X-rays concentration zone.

In the method and means according to the **Grodzins** patent, action on the object is done by a narrow beam of radiation penetrating through the object. In this instance, in contrast to the claimed method and means, all elements of the object's internal structure that are on the path of the said beam are in the same conditions. In other words, in the method and means

according to the **Grodzins** patent, there is no radiation concentration similar to the one that takes place in the claimed method and means.

For better clarification of the above, the applicant would additionally like to draw attention to the following. There is no mention in the **Grodzins** patent of the term "concentration" or its equivalent, or any other word with the same or similar meaning. This not a mere omission or pure accident - concentration of radiation is absent in the **Grodzins** patent. On the other side, it is the presence of radiation concentration that makes the main specific feature of the claimed inventions compared to inventions under **Grodzins** patent. In this instance, specific attention should be paid to complete wording of limitations concerning concentration of radiation rather than to just the presence of concentration:

*"...X-rays concentration is done in the zone located within the target area (7) of object (5) and covering the current point, to which the measurement results are attributed" (claim 20 and depending claim 21);*

*"... an X-rays concentration means (2) for concentration of radiation from the said one or more X-ray sources (1) in the zone located inside the target area (7) of object (5) and covering the current point, to which the measurement results are attributed" (claim 27 and depending claims 31-38).*

Due to noted specific features, in the claimed inventions the radiation concentration zone is imaged during subsequent formation of stereoscopic (spatial, three-dimensional) image of

the object's inner structure as an element of this image - a voxel, its brightness corresponding to the substance density measured for this particular position of the concentration zone. The concentration zone, being a part of the inner space of the object under study that can later become a voxel of the stereoscopic image, and concentration of primary x-rays in this zone exist objectively and independent on whether the secondary radiation is transported to the detectors or not, whether there is registration of this radiation by detectors or not, or whether the imaging takes place or not.

**In addition, as part of the suggested device under claim 27, there is an x-ray optical system that is made a whole unit and movable as one single construction (see figure 1, items (8) and (9)).** The x-ray optical system comprises:

- the source (sources) (1) of primary x-rays;
- means (2) for concentration of radiation in the zone (4) located inside the target area (7) of object (5) and covering the current point, to which the measurement results are attributed;
- detectors 6 of the secondary radiation excited in the substance of the object (5) in the zone (4) of primary radiation concentration;
- means (3) for transportation of secondary radiation to detectors.

Since the relative position of the elements in the x-ray optical system is constant, the means (3) transporting secondary radiation to the detectors are always "aimed" at zone (4), in which the radiation from the source (sources) is concentrated.

All voxels of the obtained image result from measurements of the intensity of secondary radiation transported from the concentration zone to one and the same detector permanently "aimed" at this zone (or to several same detectors also permanently "aimed" at the same zone).

The device according to **Grodzins** patent has no such x-ray optical system and lacks radiation concentration in future voxels. Spatial elements corresponding to voxels, are formed virtually - as an intersection of the collimated beam 35 (Figure 3) of primary x-rays and detector cells' field of view (42, 43), formed by collimators (44, 45). The field of view of each of detector's cells (see, for example, vertical dotted curve 46 in figure 3 of **Grodzins** patent) crosses not only beam 35, but also all beams parallel thereto, as formed by element 36, and each cross-section has its own virtual voxel corresponding to it. Therefore, in the **Grodzins** patent, it is not only concentration of radiation in a zone that is fixed relatively to the source which is absent, but the above permanent "aiming" at this zone of the means transporting secondary radiation is absent too.

**Applicant wishes to emphasize again that the specific feature of the claimed inventions concerning concentration of**

radiation should be regarded as "concentration in the zone located within the target area (7) of object (5) and covering the current point, to which the measurement results are attributed", i.e. on the whole, since only such wording would be meaningful from the engineering point of view. The inventions under the *Grodzins* patent have no such feature, hence, the very issue of alleged identity between the claimed inventions and inventions according to the said patent, is incorrect in essence. None of the claimed inventions falls under the action of *Grodzins* patent, nor is anything disclosed in its description; and vice versa is true - inventions under the *Grodzins* patent are not disclosed either in claims or description of the subject application.

The claimed inventions are not disclosed in the *Grodzins* patents either within the independent claims 20 and 27, or particular cases described in dependent claims. Unbiased examination of the claimed inventions with regard to above explanations would lead unambiguously to this conclusion, which is not an unsubstantiated *general allegation*, mentioned in 37 CFR 1.111(b).

The only thing that is common between the claimed inventions and the inventions according to the *Grodzins* patent is the principle of obtaining image using secondary radiation, but implementation of this principle in the claimed inventions and the *Grodzins* patent is completely different.



Hence, provisions of 35 U.S.C. 102(b) are not applicable in this case.

3. It has been shown above that the specific features of the claimed inventions:

*"...X-rays concentration is done in the zone located within the target area (7) of object (5) and covering the current point, to which the measurement results are attributed" (claim 20);*

and

*"... an X-rays concentration means (2) for concentration of radiation from the said one or more X-ray sources (1) in the zone located inside the target area (7) of object (5) and covering the current point, to which the measurement results are attributed" (claim 27)*

are not known and are new both for the method and for the device designed for obtaining the image of the object's inner structure with the help of x-rays, including with regard to the **Grodzins** patent that is also based on use of secondary radiation excited in the substance of an object.

Therefore, when these inventions are examined for their compliance with the condition of unobviousness (35 U.S.C. 103(a)), it is incorrect to discuss whether these or other ways suggested in the application, in which the specific features concerning concentration and other specific features related thereto are implemented, are obvious for person skilled in the art. Such discussion would have been appropriate should the

method and device of the stipulated purpose containing the said specific features be known. But none of the patents mentioned by the examiner as opposable would give a person skilled in the art information, that in the method obtaining the image of the object's inner structure it is necessary to create x-ray concentration zones around the points corresponding to voxels of the future stereoscopic image and that the device must have means creating such zones. In the absence of such information, a person skilled in the art will never think of how to create such zones and what else should be additionally included in the method and device. Consequently, repute of some x-ray concentration means themselves, such as x-ray lenses according to **Yan** patent, may never be a stimulus for a person skilled in the art to use them in the method and device of the said purpose, moreover particularly in such a combination with other elements as claimed in the application.

Similarly, there may be no stimulus for inclusion in the combination being created of any other known means. For example, in the absence of information about the applied principle of operation of the method and device for inner structure imaging, the issue of the method of scanning and of the necessity of scanning is meaningless. Only if the claimed principle had been known that is based on concentration of x-rays around points corresponding to voxels of the future stereoscopic image, could there have been an issue of necessity of scanning and ways and means to implement it.

Similarly, in the absence of information about the applied principle of operation of the method and the inner structure-imaging device, no issue could arise regarding incorporation in the device of sensors monitoring the current position of the concentration zone. Therefore, the examiner's reference to the **Vogeley** patent, from which use of sensor 18 monitoring the position of the conveyor band whereon the exposed object is placed, looks evidently "stretched". Knowledge about use of such sensor when the principle of concentrating primary radiation around points corresponding to voxels of the future stereoscopic image is unknown cannot be a prompt to a person skilled in the art, that the construction of the device according to the new claim 27 should include specifically a sensor monitoring the relative position of radiation concentration zone in respect of the object.

The **Vogeley** patent implements the usual rontgenoscopy method based on shadow projection that contains no prompt to a person skilled in the art regarding construction of a device designed for obtaining images on the basis of information on the substance density in specific internal points of the object, which would include the x-ray optical system as discussed above. Such **x-ray optical system comprising fixed relatively to each other and moved as a single whole, an x-ray source (sources) of primary radiation, means concentrating this radiation in a zone inside the object, a detector (detectors) for secondary radiation, and means transporting this secondary radiation to the said detectors, is not known either from the Grodzins patent, or from the Vogeley patent.** Thus, the presence

in the **Vogeley** patent of sensor 18 monitoring the conveyor band position has nothing in common with the sensor in the claimed device, which sensor responds to movement of the said x-ray optical system as a whole unit and providing the information about position of the point in the concentration zone, *to which the measurement results are attributed*, specifically because the elements of x-ray optical systems are fixed relatively to each other.

The device according to the **Vogeley** patent, where there is no x-ray optical system with the same set of elements as in the claim 27 that constitute, from the point of view of mechanics, a single unit, cannot prompt a person skilled in the art incorporation in the device of a sensor to obtain information about position of the point in the concentration zone, *to which the measurement results are attributed*.

Hence, it remains unproved, which information from the prior art could prompt a person skilled in the art to create a device designed for imaging the inner structure of an object on the basis of secondary radiation, using specifically the principle of concentrating primary x-rays in the zones around the points correspondent to voxels of the future stereoscopic image, and combine the source (sources) of primary radiation, means for its concentration, detectors for secondary radiation, and the means for transportation of the secondary radiation to the detectors in the same way as it is done in the x-ray optical system according to claim 27.

Therefore, the provisions of 35 U.S.C. 103(a) are not applicable to the claimed inventions as well.

The patent of Yan contains information about X-ray lenses and their capability of focusing radiation to a point or quasi-parallel beam. But it does not give any hint to a person skilled in the art, facing the problem of creating means for obtaining information about substance density distribution inside the object to acquire a three-dimensional image, or a totality of two-dimensional images replacing it. Indeed, it does not follow from it in any way that it is necessary or useful to concentration radiation, in particular, by way of its focusing, to resolve the said problem, while it is clear from the patent of Grodzins, that it is possible to do without concentration.

The patent to Yan, as is noted by the Examiner, contains some information about means for collecting X-rays. But the claimed inventions do not provide for any new means for collecting radiation. In addition, the recited means are used in the claimed inventions not for collecting radiation, i.e. not for the purpose of obtaining radiation of higher intensity; they are used for transportation to the detector (detectors) of the secondary radiation specifically from zone (16), in which the primary radiation is concentrated (and not from all parts of the object exposed to primary radiation).

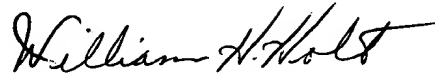
Applicant respectfully submits that in view of the foregoing remarks and explanations, it is clear that the cited prior art neither teaches nor suggests applicant's claimed invention. Accordingly, reconsideration of the application is requested and allowance of claims 20-27 and 31-38, along with previously

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allowed claims 28-30, is courteously solicited.

Respectfully submitted,

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William H. Holt  
Reg. No. 20766

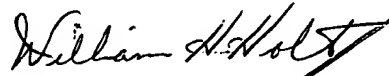
Law Offices of William H. Holt  
Unit 2, First Floor  
1423 Powhatan Street  
Alexandria, Virginia 22314  
Telephone: (703) 838-2700  
Facsimile: (703) 838-2701

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Alexandria, VA 22313-1450

on June 30, 2003.



William H. Holt  
Reg. No. 20,766